Swiss Index

Rulebook Swiss Reference Rates

06.07.2022

C1 Public

Table of Contents

1 Structure of Swiss Reference Rates

1.1 Introduction

Repo transactions are an important instrument for daily liquidity management. For the financial markets, SIX calculates and publishes Swiss Franc reference rates and indices for the various tenors from overnight to 12 months and compounding of historical interest rates ("compounding in arrears"). The specifications for the reference interest rates have been prepared in cooperation with the Swiss National Bank (SNB), the National Working Group on Swiss Franc Reference Rates and the Index Commission.

The reference interest rates and indices are based on transaction data from the CHF interbank repo market of SIX Repo Ltd. Repo transactions represent an important instrument for banks in their daily liquidity management. Internationally, the repo business has advanced to become an important money market instrument. The SNB also uses the repo market to implement its monetary policy.

For the calculation of the reference interest rates and indices, only standardized GC contracts[1] in CHF on the interbank market against SNB-repo-eligible securities with fixed interest rate are used.

1.2 General Principles

This rulebook is based on the following basic principles. SIX follows the basic principles when situations arise that are not foreseen in the rulebook or in case of doubt.

- **Representative:**
  The development of the market is represented by the index.
- **Tradable:**
  The index components are the result of active trading in the Swiss Repo Market.
- **Replicable:**
  The development of the index can be replicated.
- **Stable:**
  High index continuity.
- **Rules-based:**
  Index changes and calculations are rule-based.
- **Projectable:**
  Changes in rules are with appropriate lead time (usually at least 2 business days) – no retrospective rule changes.
- **Transparent:**
  Decisions are based on public information.

1.3 Revision History

Date	Version	Description
24.03.2021	1.00	Addition of new SARON Compound Rates and Indices in Section "1.3 Index Family"
17.06.2021	1.10 (current)	Introduction of "Appendix A" that highlights the Lookback Formulas for Compound Rates.

[1] GC contract: GC stands for General Collateral. In a repo transaction, the money that is loaned out is secured against securities of a defined quality that are drawn from a GC basket.

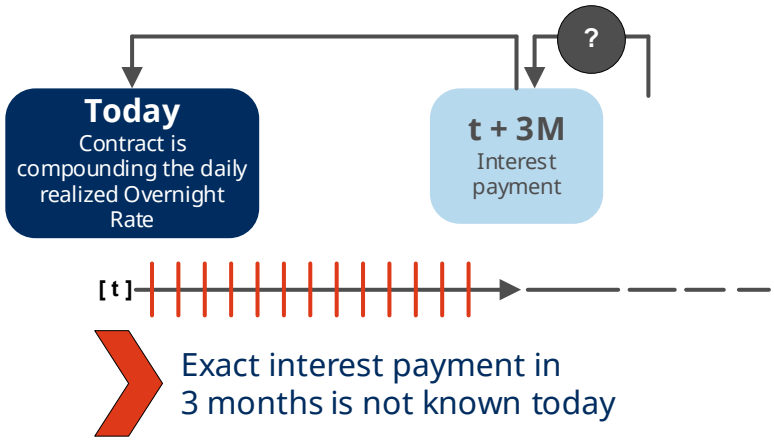
Date	Version	Description
17.12.2021	1.20	Insertion of Section "1.3 Revision History" as well as Section "1.4 Term Rate Terminology" that highlights the different types of Term Rates (in advance, in arrears). Expanded and reworded Section "8. Governance" to increase transparency of bodies when calculating indices.
06.07.2022	1.30	Adjustment/Replacement of Section 7 ("Correction Policy") as well as smaller reworks/corrections in the document.

1.4 Explanation of Term Rates

The Swiss Reference Rates are consist of interest rates that are determined in the CHF repo market. However, different interest rates with different tenors are traded there and not all of them are suited to replace CHF LIBOR. The National Working Group on Swiss Franc Reference Rates (NWG) therefore recommends **using a compounded SARON wherever possible to replace CHF LIBOR.** [2] Unlike CHF LIBOR, SARON Compound Rates are backward-looking (in arrears) term rates.

1.4.1 Backward-Looking Term Rates (in arrears)

The alternative to a forward-looking Reference Rate such as the 3m CHF LIBOR is a term rate that results from the daily compounding of daily rates in arrears. The SARON 3 months Compound Rate is therefore the daily overnight rate (SARON) compounded over a period of three months. Consequently, the effective interest rate and the associated payment is not known until the end of the three-month period (in arrears).

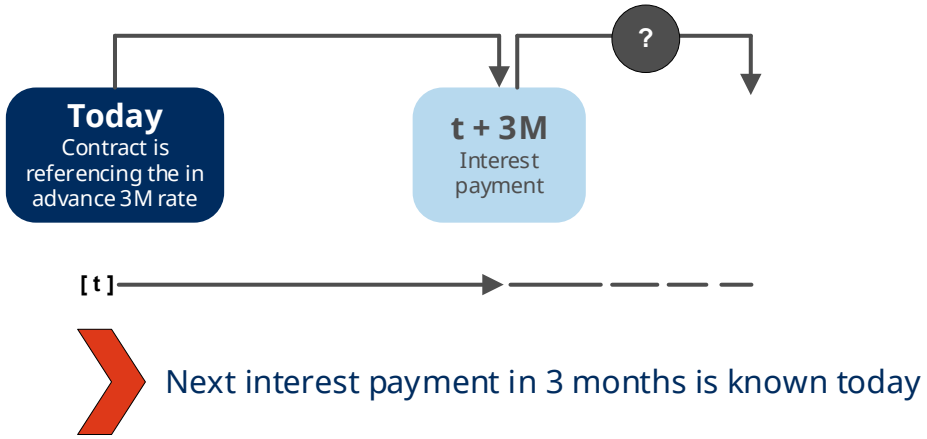


The SARON Compound Rates are therefore based on the **S**wiss **A**verage **R**ate **O**ver**n**ight (SARON) which is traded daily and has the highest transaction volume in the Swiss repo market. As the underlying transactions are all collateralized by securities, this rate hardly reflects any credit risk.

1.4.2 Forward-Looking Term Rates (in advance)

In the Swiss repo market, however, there are still forward-looking term rates. These are also Swiss Average Rates but for a longer tenor than Overnight (e.g. SARTN, SARSN, SAR1W, SAR1M, etc.). They represent the cost of borrowing money against high quality collateral for longer tenors among repo members. Similar to CHF LIBOR, these rates are known at the beginning of the contract.

[2] https://www.snb.ch/n/mmr/reference/minutes_20181031/source/minutes_20181031.n.pdf



However, liquidity in these rates with a tenor of more than one week is rather low. It can take several days for an interest with before an interest rate with a tenor of three months (SAR3M) is traded, with the corresponding volume being rather low (in the single to double-digit million range).

For this reason, these forward-looking Swiss Average Rates for longer tenors **cannot be considered a robust alternative to CHF LIBOR**. [3]

1.5 Overview for Backward-looking Term Rates

Backward-Looking Compound Term Rates (in arrears)				
Tenors	**Compound Rates**	**Current Rates**	**Indices**	**Current Indices**
1 week – in arrears	SARON 1 week Compound Rate	n/a	SARON 1 week Compound Index	n/a
1 month - in arrears	SARON 1 month Compound Rate	n/a	SARON 1 month Compound Index	n/a
2 months - in arrears	SARON 2 months Compound Rate	n/a	SARON 2 months Compound Index	n/a
3 months - in arrears	SARON 3 months Compound Rate	n/a	SARON 3 months Compound Index	n/a
6 months - in arrears	SARON 6 months Compound Rate	n/a	SARON 6 months Compound Index	n/a
9 months - in arrears	SARON 9 months Compound Rate	n/a	SARON 9 months Compound Index	n/a
12 months – in arrears	SARON 12 months Compound Rate	n/a	SARON 12 months Compound Index	n/a
1 month IMM - in arrears	SARON 1 IMM Compound Rate	n/a	n/a	n/a
3 months IMM - in arrears	SARON 3 IMM Compound Rate	n/a	n/a	n/a

The calculations for a compounded SARON are offered for pre-defined time periods that extend beyond the overnight tenor. These SARON compound rates support benchmarking and offer different observation periods for application in financial products like mortgages, deposits, bonds, floating rate notes, overnight indexed swaps and futures.

[3] https://www.snb.ch/n/mmr/reference/minutes_20181031/source/minutes_20181031.n.pdf

- The SARON 1 week Compound Rate reflects the compounded daily SARON interest rates at the end of a period of one week and is calculated in arrears. The time period of the SARON 1 week Compound Rate ends on each business day of a week and starts on a business day one week before.
- The SARON 1 month Compound Rate reflects the compounded daily SARON interest rates at the end of a period of one month and is calculated in arrears. The time period for the SARON 1 month Compound Rate ends on each business day of a month and starts on a business day one month before.
- The SARON 2 months Compound Rate reflects the compounded daily SARON interest rates at the end of a period of two months and is calculated in arrears. The time period of the SARON 2 months Compound Rate ends on each business day of a month and starts on a business day two months before.
- The SARON 3 months Compound Rate reflects the compounded daily SARON interest rates at the end of a period of three months and is calculated in arrears. The time period for the SARON 3 months Compound Rate ends on each business day of a month and starts on a business day three months before.
- The SARON 6 months Compound Rate reflects the compounded daily SARON interest rates at the end of a period of six months. The time period for the SARON 6 months Compound Rate ends on each business day of a month and starts on a business day six months before.
- The SARON 9 months Compound Rate reflects the compounded daily SARON interest rates at the end of a period of nine months and is calculated in arrears. The time period for the SARON 9 months Compound Rate ends on each business day of a month and starts on a business day nine months before.
- The SARON 12 months Compound Rate reflects the compounded daily SARON interest rates at the end of a period of twelve months and is calculated in arrears. The time period for the SARON 9 months Compound Rate ends on each business day of a month and starts on a business day twelve months before.
- The SARON 1 IMM Compound Rate reflects the compounded daily SARON interest rates at the end of a period of one month and is calculated in arrears. The time period for the SARON 1 IMM Compound Rate ends on the 3rd Wednesday of a month and starts on the 3rd Wednesday one month before.
- The SARON 3 IMM Compound Rate reflects the compounded daily SARON interest rates at the end of a period of three months and is calculated in arrears. The time period for the SARON 3 IMM Compound index ends on the 3rd Wednesday of a month and starts on the 3rd Wednesday three months before.

Further SARON Compound Rates and indices for other periods or other calculations for a compounded SARON can be provided on request.

1.6 Overview for Forward-Looking Term Rates

In advance Term Rates				
Tenors	**Average Rates**	**Current Rates**	**Average Indices**	**Current Indices**
Overnight ON – in advance	SARON	SCRON	SARON Index (SAION)	SCION
Tom/Next TN – in advance	SARTN	SCRTN	n/a	n/a
Spot/Next SN – in advance	SARSN	SCRSN	n/a	n/a
1 Week 1W – in advance	SAR1W	SCR1W	n/a	n/a
2 Weeks 2W – in advance	SAR2W	SCR2W	n/a	n/a
3 Weeks 3W – in advance	SAR3W	SCR3W	n/a	n/a
1 Month 1M – in advance	SAR1M	SCR1M	n/a	n/a
2 Months 2M – in advance	SAR2M	SCR2M	n/a	n/a
3 Months 3M – in advance	SAR3M	SCR3M	n/a	n/a
6 Months 6M – in advance	SAR6M	SCR6M	n/a	n/a
9 Months 9M – in advance	SAR9M	SCR9M	n/a	n/a
12 Months 12M – in advance	SAR12M	SCR12M	n/a	n/a

These forward-looking rates are determined by repo market participants in active trading. However, they are hardly used for benchmarking purposes. Only the interest rates of the shortest SARON tenor rates, which have the highest trading volume, are relevant and are used for compound rates. The longer tenor rates are not considered as robust and are only published for information purposes for repo participants. They **cannot be considered valid replacements for the CHF LIBOR term rates**. It is recommended to replace CHF LIBOR term rates with SARON Compound Rates with similar tenors. [4]

1.7 Data Availability and Publication

All Swiss Reference Rates, including SARON, SARON Index and SARON Compound Rates are calculated and published according to the CHF repo calendar of the SIX repo trading platform (the CHF repo calendar is identical to the CHF currency or CHF money market calendars). There is no publication on non-business days.[5] For compounding purposes the SARON prior to a weekend or other holiday is used in the upcoming overnight period including the weekend or currency holiday. The following table shows for how many days the overnight SARON is valid, especially around weekends (a_i being the number of calendar days in the period for which SARON applies).

[4] https://www.snb.ch/n/mmr/reference/minutes_20181031/source/minutes_20181031.n.pdf

[5] https://www.six-group.com/en/products-services/the-swiss-stock-exchange/market-data/news-tools/trading-currency-holiday-calendar.html#/currencyCalendar

Date	Weekday	a_i	Comment
08.10.2018	Monday	1 day	The SARON calculated on Monday is valid for the upcoming overnight period until Tuesday.
07.10.2018	Sunday	n/a	There is no SARON available. Friday's SARON value is applied over the weekend.
06.10.2018	Saturday	n/a	There is no SARON available. Friday's SARON value from is applied over the weekend.
05.10.2018	Friday	3 days	The SARON determined on Friday is applied over the weekend and is valid for the upcoming overnight period through Monday.
04.10.2018	Thursday	1 day	The SARON calculated on Thursday applies to the upcoming overnight period through Friday.

2 Calculation of Average the Rate (for Example SARON)

The calculation of the Average Rate is based on completed trades (Tp) or on a reference price (Rq), which is based on quotes and rounded to six decimal places. A new calculation is triggered each time a trade is concluded, or a new price is quoted, provided they meet the following specifications.

2.1 Trades

The price of a trade directly flows into the index calculation with the associated volume (V_T), provided that the price is within the trade filter of 50 basis points (bp): P_{n-1} - 50 bp ≤ T_p ≤ P_{n-1} + 50 bp. Prices that exactly match the limit are considered for calculation. There is a quote limit on the volume of a trade (see below). If a trade is reversed, this does not lead to a retrospect correction of the Average Rate.

2.2 Quotes

2.2.1 Quote Filter

The calculation of the reference price (R_q) is based on available quotes in the order book, provided they are within the quote filter[6]. The starting point for the quote filter is the average price between the bid and ask sides, the so-called mid-price(m). This corresponds to the volume-weighted average of the best buy and sell quotes. The quote spread (q_n) is - measured against the mid-price (rounded to fifth decimal place) - three basis points: m + 3 bp ≥ quote ≥ m - 3 bp. Quotes that exactly match the limit as well as quotes that are only accessible to a selection of participants are considered for the calculation.

2.2.2 Quote Rules

For the calculation of the reference price (R_q), any number of quotes can be included, provided that they are within the quote range (q_n) and lie within the order book depth 10, i.e. only the maximum of ten best buy and sell quotes are considered for the calculation. For each order side, a maximum of one quote per bank is taken into account, provided that the quotes are different. Furthermore, it is possible that the number of prices taken into account on the ask side is greater than that on the bid side and vice versa. If no quotes are within the quote range (q_n), the mid-price (m) is used as the new reference price (R_q).

2.2.3 Quote Volume

The volume of quotes is limited to CHF 100 million. If there are several identical quotes per order side but with different volumes, the volume of these quotes is aggregated for the calculation of the mid-price (m). The aggregated volume is capped at CHF 100 million.

The volumes of the quotes that are within the quote range (q_n) and are identical are cumulated and capped at CHF 100 million. The volumes placed for the quotes taken into account are added to calculate the average volume (integer value), whereby the aggregated volume per quote is again capped at CHF 100 million. This average volume is included in the recalculation of the Average Rate.

2.2.4 Restrictions

In the following cases, no new calculation of the Average Rate is triggered and the last reference price remains valid:

- There is only one side (bid or ask price) or there are no quotes in the order book.
- New quotes are added to the order book which do not change the reference price (R_q) compared to the previous value and do not affect the total volume for the reference price (R_q).
- The volume changes of a quote already existing in the order book do not trigger a new calculation.
- The spread between the best bid and ask quotes exceeds 20 basis points.

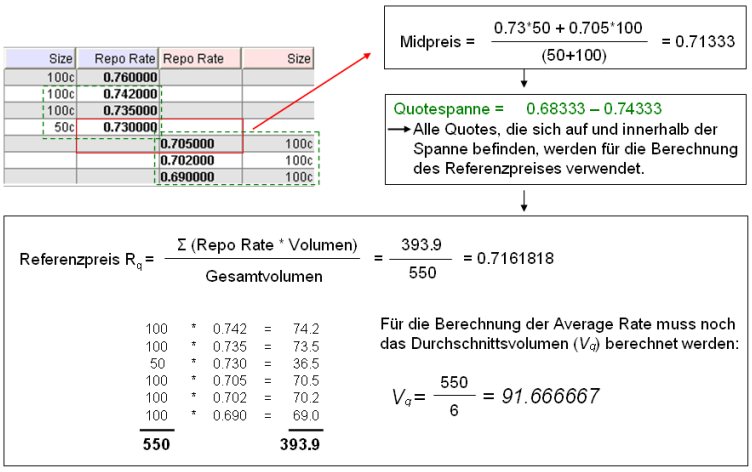
[6] The use of a quote filter prevents quotes that diverge sharply from the current interest level distorting the Average Rate.

2.3 Formula

	Formula	Legend
Average Rate (**AR_n**)	$AR_n = \frac{AR_{(n-1)} \cdot \sum_{j=1}^{n-1} v_j + p_n \cdot v_n}{\sum_{j=1}^{n} v_j}$	$\sum_{j=1}^{n-1} v_j$ = Previous volumes for reference prices and trades used for the reference rate calculation
Trade Filter	**P_{n-1}** – 50 BP ≤ **T_p** ≤ **P_{n-1}** + 50 BP	
Price (**P_n**)	$p_n \nearrow T_p$ $p_n \searrow R_q$	**P_n** = Relevant price for the calculation, - based on a trade (**T_p**) or - a reference price (**R_q**)
Volume (**V_n**)	when **P_n** = **T_p** → **V_n** = **V_T** when **P_n** = **R_q** → **V_n** = **V_q**	**T_p** = Price of a trade **V_T** = Volume of a trade (unlimited)
Calculation of the Reference Price (R_q):		
Mid-Price (**m**):	$m = \frac{b \cdot v_b + s \cdot v_s}{v_b + v_s}$	**b** = Best Buy **v_b** = Volume **b** (max.100 M) **s** = Best Sell **v_s** = Volume **s** (max.100 M)
	If **s**=0 and/or **b**=0 -> no update	
Quote Spread (**q_n**)	(**m** + 3 BP ≥ **q_n** ≥ **m** - 3 BP)	**q_n**= Buy and sell price within the - range
Reference Price (**R_q**)	$R_q = \frac{\sum_{j=1}^{n} q_j \cdot v_j}{\sum_{j=1}^{n} v_j}$	**q_j** = Quotes in q_n **v_j** = Volume of quote j **j** = 1, 2, 3, ... max. volume per quote = CHF 100 M max. aggregated volume for identical quotes = CHF 100 M
Volume of R_q (**V_q**)	$V_q = \frac{\sum_{j=1}^{n} v_j}{n}$	**V_q** = Average volume max. volume per quote = CHF 100 M max. aggregated volume for identical quotes = CHF 100 M
If **q_n** = { }	**R_q** = **m** and **V_q** = ($v_b + v_s$) / 2	**v_b** = Volume **b** (max. 100 M) **v_s** = Volume **s** (max. 100 M)

2.4 Calculation Example Reference Price R_q

The price of a trade as well as quotes can be entered by market participants with up to six decimal places. Prices which correspond exactly to the limit value are considered for the calculation. In the example below, a new calculation is triggered by a new quote.



All quotes which are within the quote range (q_n) are used for the calculation of the reference price (R_q). They are weighted according to their volume, added together and finally divided by the total volume (sum of all volumes of the quotes considered). For the calculation of the Average Rate, the average volume must be considered.

2.5 Calculation Interval and Publication Times

The calculation of the Average Rate is started with the first constellation in the order book. The first publication takes place at 08:30 CET. and the last at the end of the business day, defined by the so-called cut-off time, whereby, the Average Rates of the different tenors can have different trade closing times (cut-off times). Since the cut-off time does not have to coincide with the publication times of the Average Rate, the publication of the last value for the Average Rate can take place outside the defined publication interval of 10 minutes.

Daily at 12:00, 16:00 and at the end of the trading at 18:00 CET, the price value of the Average Rate is published at these respective times and marked as Fixing[7].

The calculation of the Average Rate is performed continuously (real-time), whereas its publication takes place every ten minutes. SARON Compound Rates are published after the close of trading. They are available on the Index Data Center website at around 18:50. and are distributed via SIX Exfeed at around 19:00.[8]

The calculation and publication of the reference rates and indices takes place on all official trading days of the Swiss Franc repo market.

If no fixing of the Average Rates (except for SARON) is available on a given day, the last published value from the previous trading day remains valid, and no new value is published.

If no fixing of the overnight rate SARON is available on a given day, the last published value from the previous trading day will be used and published.

All data is distributed by SIX Exfeed, a subsidiary of SIX Group.

[7] Due to differing liquidity conditions for the respective tenors, it is possible that some Average Rates have less than three Fixings. If there is no trading in an Average Rate on a given business day, the previous Fixing of that Average Rate is carried forward.

[8] https://www.six-group.com/exchanges/indices/data_centre/swiss_reference_rates/compound_rates_en.html

3 Calculation of the Current Rate (for Example SCRON)

The Current Rate shows the course of trading during the day and reflects the current market price. The Current Rate can be used to read the trend of the market performance. Thus, they can also be used as indicators for short-term changes.

3.1 Trades and Quotes

The calculation and publication of the Current Rate does not take place in real time, but in intervals of three minutes and is rounded to six decimal places. The last observed trade of the publication interval is considered. If this trade is missing in the mentioned period, the mid-price is calculated and published as the Current Rate (the trade has priority over the mid-price). If no new trades have been concluded or no new quotes have been placed in the order book within the three-minute interval, the previous Current Rate is published again. This also applies, in the absence of a trade, the spread between the best buy and sell quotes exceeds 20 basis points.

3.2 Formula

	Formel	Legend
Current Rate (**CR_t**)	If **T** exists in the interval prior to publication: $CR_t = T$ Otherwise: $CR_t = M$	**T** = Trade **M** = Mid-Price
Mid-Price (**M**)	$M = \frac{b+s}{2}$ If **s** = 0 and/or **b** = 0 → last available mid-price	**b** = Best Buy **s** = Best Sell

3.3 Calculation Example

Times at which the current rate is published:	**The intervals are:**
– **V1** = 8:30:00	– to 8:29:59 = **V1**
– **V2** = 8:33:00	– 8:30:00 - 8:32:59 = **V2**
– **V3** = 8:36:00	– 8:33:00 - 8:35:59 = **V3**
– **V4** = 8:39:00	– 8:36:00 - 8:38:59 = **V4**

Timing	**8.29**	**8.31**	**8.32**	**8.37**
Best Sell	0.59		0.60	0.65
Best Buy	0.61		0.62	0.75
Trade		0.63		
M or T	M	T	M	M

Publication:

V1 (8:30)	No trade yet	**CR_{V1}** = (0.59 + 0.61) / 2 = 0.60
V2 (8:33)	Trade present at 8:31 within the interval	**CR_{V2}** = 0.63
V3 (8:36)	No changes in quotes or trades	**CR_{V3}** = **CR_{V2}** = 0.63
V4 (8:39)	No trade present within the interval	**CR_{V4}** = (0.65 + 0.75) / 2 = 0.70

3.4 Calculation Interval and Publication Times

The first calculation and publication of the Current Rate takes place at 8:30 CET and the last at the end of the business day, defined by the so-called cut-off time, whereby the Current Rate of the different tenors can have different trading cut-off times. Since the cut-off time does not have to coincide with the publication times of the Current Rate, the publication of the last value for the Current Rate figure can take place outside the defined publication interval of three minutes.

The calculation of the Current Rate takes place immediately before the publication. This takes place every three minutes.

The calculation and publication of the reference rates and indices takes place on all official trading days on the Swiss Franc repo market.[9]

If no Current Rates (except SCRON) are available on a given day, the last published value from the previous business day remains valid and no new value is published.

If no fixing of the overnight current rate SCRON is available on a given day, the last published value from the previous trading day will be used and published.

All data is distributed by SIX Exfeed, a subsidiary of SIX Group.

[9] https://www.six-group.com/en/products-services/the-swiss-stock-exchange/market-data/news-tools/trading-currency-holiday-calendar.html#/currencyCalendar

4 Calculation of the Average and Current Indices (for Example SARON Index)

For the tenor "overnight", SIX calculates and publishes one index each based on the Average and the Current Rate, which reflects the performance of daily recorded overnight transactions. Further indices based on the SARON Compound Rates are available.

4.1 Formula

Index I_t

$$I_t = I_T \left(1 + \frac{SRR_T}{360} D_{T,t}\right)$$

Legend:	
I:	Index
t:	Current trading day
T:	Last trading day prior to t
SRR	Swiss Reference Rate (as a percentage) of the corresponding tenor and price type
D:	Number of calendar days between **t** and **T**
Interest Convention:	Current/360
	Publication at time **t** with date stamp **t** (no time stamp)

4.2 Calculation Example

Index level at time **T**	100
Swiss Reference Rate (overnight) at time **T**	0.15
Number of calendar days between **t** and **T**	1
Index at time **t**	$I_t = 100\left[1+\left(\frac{0.15/100}{360}\right)1\right] = 100.000417$

4.3 Calculation Interval and Publication Dates

The indices are calculated and published once a day at the end of each trading day (rounded to six decimal places).

The Reference rates and indices are calculated and published on all official trading days on the Swiss Franc repo market.

All data is distributed by SIX Exfeed, a subsidiary of SIX Group and published on the website in the Index Data Center.

5 Calculation of SARON Compound Rates

5.1 Formula

The SARON Compound Rates are calculated in arrears for pre-defined past time periods using the following formula.

$$SARON\ Compound\ Rate = \left[\prod_{i=1}^{bd}\left(1+\frac{r_i a_i}{360}\right)-1\right]\frac{360}{n}$$

bd	Number of trading days for an observation period from the start date (inclusive) to the end date (exclusive) date. For example, "bd" is equal to one (1) for an observation period from Monday to Tuesday
i	Index from one to bd
n	Number of calendar days of the observation period from the start date (inclusive) to the end date (exclusive). For example. "n" is equal to one (1) for an observation period from Monday to Tuesday
r_i	SARON on business day i
a_i	Number of calendar days for which SARON ri applies

Alternatively, the SARON Index (SAION), which also belongs to the family of Swiss Reference Rates, can be used to calculate the SARON Compound Rates. The SARON Index reflects the performance of SARON through daily compounding. Further details on the methodology and formula of the SARON Index are described in section 4.

$$SARON\ Compound\ Rate = \left(\frac{SARON\ Index_E}{SARON\ Index_S}-1\right)\frac{360}{n}$$

n	Number of calendar days for an observation period from the start date S (inclusive) to the end date E (exclusive)
	$SARON\ Index_S$ and $SARON\ Index_E$ - SARON Index value at the start date S and end date E

The advantage of using the SARON Index is that only two data points are needed to calculate the compounded SARON value for a given tenor, while the standard formula requires daily data of the SARON value. Both formulas can be used to calculate a compounded SARON for any combination of trading days.

Since the SARON Index reflects the same arithmetic as a compounded SARON and the SARON Compound Rates, calculations using the SARON Index with the same start and end dates should effectively produce equivalent results. However, because the SARON Index is rounded, its values do not have the same precision as the compounded SARON. Therefore, minor differences may occasionally occur at the fourth decimal place.

The SARON Compound Rates are calculated to four decimal places and rounded with standard commercial practice.

5.2 Definition of Start and End Dates for SARON Compound Rates

The SARON Compound Rates are provided for pre-defined tenors. The end date for each period is the current business day on which the underlying rate, SARON, is calculated. The start date for the daily SARON Compound Rates is the business day that is the corresponding number of weeks/months prior to the end date. The determination of the start date is aligned with the CHF money market calendar.[10] If a determined start date falls on a non-business day like a weekend or a currency holiday, the start date will be adjusted.

[10] https://www.six-group.com/en/products-services/the-swiss-stock-exchange/market-data/news-tools/trading-currency-holiday-calendar.html#/currencyCalendar

In the CHF money market calendar, the end date is set in advance based on the start date and the non-business days are adjusted according to the Modified Following Business Day Convention. There are three scenarios:

- If the start date falls on the last business day of a month, the end date must also fall on the last business day of a month.
- If the end date falls on a non-business day, the time period is extended by moving it to the next business day unless it falls in a new month.
- If the postponement of the date causes the end date to fall in a new month, the period is shortened by moving it moving it to the previous business day.

Note: For SARON Compound Rates with a tenor of less than one month (e.g. weekly), the scenarios do not apply, as the month-end restrictions are obsolete in such a case.

The SARON Compound Rates are calculated retrospectively, therefore the Modified Following Business Day Convention cannot be applied directly. In order to align as closely as possible with the CHF money market calendar and the Business Day Convention, the start date is determined as follows:

- If the date is unique according to the CHF money market calendar, it will be used as the start date.
- If the end date falls on the last business day of a month, the start date must also be the last business day of a month.
- For each end date with several possible start dates according to the CHF money market calendar, the following applies (unless the end date is the last business day of a month:
  - In case of an uneven number of possible start dates, the middle date will be chosen as the start date
  - In case of an even number of possible start dates, the earlier of the two middle dates will be chosen
- If the originally calculated start date falls on a non-business day or non-existent date (e.g. 30th of February), the business day preceding the calculated start date will be the used as the start date, unless this new start date would fall in a different month. In this case, the following business day will be used as the start date and not the previous business day.

In general, SARON Compound Rates with a tenor of less than one month (e.g. weekly) simplify the determination of the start- and end dates, since the month-end restrictions are omitted. However, the other conventions of the money market calendar must be maintained.

5.3 Definition of Start the and End Dates of the SARON IMM Compound Rates

SIX provides the SARON IMM Compound Rates for pre-defined tenors. According to the IMM (International Money Market Calendar), the end date of these tenors is the 3rd Wednesday of a month and is by definition always a business day. The start date is the 3rd Wednesday of a month and is the corresponding number of months before the end date.

5.4 Examples for the Definition of Start Dates

The following table provides examples of how to define the end and start dates for SARON Compound Rates.

Time Period	End Date	Start Date	Comment
1 month	30.04.2018	29.03.2018	The end date falls on the last business day of the month. The start date is moved to the last business day of a month.
1 month	15.06.2018	15.05.2018	Unique allocation according to the money market calendar.
1 month	08.10.2018	06.09.2018 or 07.09.2018	Two possible start dates according to the money market calendar. leading to the end date 08.10.2018. The earlier date 06.09.2018 will be selected.
1 month	23.04.2018	21.03.2018 or 22.03.2018 or 23.03.2018	Three possible start dates according to the money market calendar, leading to the end date 23.04.2018. The middle date 22.03.2018 will be selected.
1 month	10.12.2019	08.11.2019	The previous business day is used since 10.11.2019 is not a non-business day.

The compounding of historical interest rates (“compounding in arrears”) and the money market calendar result in the same dates for the end-of-month periods. However, there might be differences in the day count due to currency holidays such as Easter and Christmas. The impact on calculations is small, especially for longer tenors.

5.5 Calculation Example SARON 1 Month Compound Rate

end_date	08.10.2018
start_date (two possible start dates according to the money market calendar, leading to the end date 08.10.2018. The earlier date 06.09.2018 will be selected)	06.09.2018
day_count	32
SARON Compound Rate: (product (multiplier) -1) *360 / day_count)	-0.7451
SARON Compound Rate: (SARON Index (end) / SARON Index(start) -1)* (360/ day_count)	-0.7451

Date	SARON	multiplier (1+ SARON x day_count / 360)	day_count	SARON Index
06.09.2018	-0.739773	0.999979	1	11048.90141
07.09.2018	-0.737137	0.999938572	3	
10.09.2018	-0.73405	0.99997961	1	
11.09.2018	-0.742549	0.999979374	1	
12.09.2018	-0.744533	0.999979319	1	
13.09.2018	-0.739139	0.999979468	1	
14.09.2018	-0.734535	0.999938789	3	
17.09.2018	-0.732281	0.999979659	1	
18.09.2018	-0.739414	0.999979461	1	
19.09.2018	-0.741015	0.999979416	1	
20.09.2018	-0.740611	0.999979427	1	
21.09.2018	-0.743656	0.999938029	3	

Date	SARON	multiplier (1+ SARON x day_count / 360)	day_count	SARON Index
24.09.2018	-0.736047	0.999979554	1	
25.09.2018	-0.745040	0.999979304	1	
26.09.2018	-0.760342	0.999978879	1	
27.09.2018	-0.753971	0.999979056	1	
28.09.2018	-0.785767	0.999934519	3	
01.10.2018	-0.738704	0.99997948	1	
02.10.2018	-0.734949	0.999979585	1	
03.10.2018	-0.743903	0.999979336	1	
04.10.2018	-0.742927	0.999979363	1	
05.10.2018	-0.746194	0.999937817	3	
08.10.2018				11041.58344

5.6 Calculation Interval and Publication Times

SARON Compound Rates and Indices are published after close of trading. They are available on the Index Data Center webpage around 18.50 CET. At 19:00 CET, they are distributed via SIX Exfeed.[11]

[11] https://www.six-group.com/exchanges/indices/data_centre/swiss_reference_rates/compound_rates_en.html

6 Additional Information

To assist customers in determining a compounded SARON outside of the standard 1, 3 and 6 months periods, SIX provides the "SARON Compound calculation matrix". This file contains compounded SARON values for all date combinations, including weekends and non-business days of the last 12 months. In addition, a web-based calculator for a compounded SARON is available for ad-hoc calculations.[12]

6.1 Formula for a Compounded SARON on Non-Business Days

For cases where a compounded SARON is required for a non-business day (e.g. starting or ending on a weekend), the National Working Group on Swiss Franc Reference Rates has developed the following approximation to cover non-business days.

$$compounded\ SARON\ = \left[\prod_{i=1}^{bd}\left(1+\frac{r_i a_i}{360}\right)-1\right]\frac{360}{n}$$

bd Number of business days for an observation period from the start date (inclusive) to the end date (exclusive), except if the start date is not a business day, then bd is increased by one. For example, bd is equal to one (1) for an observation period from Monday to Tuesday, two (2) for an observation period from Sunday to Tuesday and one (1) for an observation period from Friday to Sunday.

i Index from one (1) to bd

n Number of calendar days of the observation period from the start date (inclusive) the end date (inclusive). For example, n is equal to one (1) for an observation period from Monday to Tuesday

r_i SARON on business day i. If the start date is not a trading day, the SARON from the previous business day is used.

a_i Number of calendar days for which SARON r_i applies. If the observation period ends on a Sunday, a_i normally includes two days (2). If the observation period starts on a Sunday, a_i is equal to one (1) and the SARON of the previous business day is used.

[12] https://www.six-group.com/en/products-services/the-swiss-stock-exchange/market-data/indices/swiss-reference-rates/saron-calculator.html

6.2 Example for Non-Business Days

The following overview shows the day count depending on whether the observation period is starting or ending on non-business days.

	TH	FR	SA	SU	MO	TU	WE	TH	FR	SA	SU	Number of Business Days	Number of Calendar Days
Example SARON Compound Rates (Monday to Monday)	-0.72	-0.75			-0.78	-0.74	-0.75	-0.76	-0.71				
applicable days	1	3			1	1	1	1	3			bd = 5	n = 7
Example Non-Business Days (Monday to Sunday)	-0.72	-0.75			-0.78	-0.74	-0.75	-0.76	-0.71				
applicable days					1	1	1	1	2			bd = 5	n = 6
Example non-business days (Sunday to Sunday)	-0.72	-0.75		-0.75	-0.78	-0.74	-0.75	-0.76	-0.71				
applicable days				1	1	1	1	1	2			bd = 5 +1	n = 7

7 Correction Policy

SIX has procedures in place to limit the risk of publishing incorrect SAR-related rates, indices and compound rates. Nevertheless, errors may occur. The Correction Policy regulates how these errors are to be handled. Additionally, a distinction is made between unavailable data and wrong data, as the treatment in such cases is different.

7.1 Unavailable Data

If the repo data (trades and quotes) required for the calculation for the SAR-related rates, indices and compound rates are not available due to market distortions or trading disruptions, the last available data shall be used. Such cases may lead to a deviation from the basic principles of the indices defined in the respective rulebooks. These changes may relate to review schedules, ordinary reviews as well as adjustments in the index composition or weighting outside the ordinary reviews and will be publicly announced taking into account an announcement period of at least two business days.

7.2 Wrong Data

The publication of a wrong or inaccurate SAR-related rate, index or compound rate may be caused by incorrect recording or processing of the data as well as by calculation errors.

7.2.1 Error Threshold

Identified errors resulting in a deviation of +/- 2 basis points relative to the final fixing (18:00 CET) of the SAR-related rate will be corrected and republished by 22:00 CET of the same business day at the latest (see "Time Window for Corrections" below). Compound Rates and Indices based on an erroneous SAR-related rate will also be corrected.[13]

The error threshold is set annually by the Index Commission for Swiss Reference Rates (e.g., to account for different interest rate environments). In exceptional market conditions, the Commission may also adjust the error threshold on an ad-hoc basis.

Identified errors leading to a deviation of less than +/- 2 basis points relative to the final fixing do not result in a recalculation and publication but will be published semi-annually in the "Transparency Policy".

7.2.2 Time Window for Corrections

The calculation of the Swiss Reference Rates takes place on the same day as the fixing and the corresponding publication of the rates (T+0). This is in contrast to other reference rates, whose fixing and publication takes place only on the following day (T+1). The time window to detect and correct errors is therefore considerably shorter in the Swiss market.

Erroneous reference rates are therefore corrected on the same business day until 22:00 CET. Accordingly, an error must be identified by 20:00 CET at the latest to be eligible for a refix and a corresponding republication.

In case an error is identified that over-/underestimates the 18:00 fix by two or more basis points, market participants would be alerted by email and the distribution system (SIX Exfeed) would perform a reclose which results in a renewed distribution of the corrected value.

If the correct values cannot be made available by 22:00 CET, the time window will expire and no further corrections will be made. However, corresponding errors will be published semi-annually in the "Transparency Policy".

[13] The calculation of the SARON Compound Rates takes place chronologically after the SARON calculation. It is conceivable that the corrected SARON value can be determined before 22:00., but the calculation of the SARON Compound rates is no longer possible. In such a case the Compound Rates will be distributed the following day via Index SRR Services.

7.2.3 Transparency Policy

In order to increase transparency in the determination of the Swiss Reference Rates, SIX publishes al semi-annually summary of errors with a deviation of less than +/- 2 basis points relative to the final fixing, as well as errors identified outside the time window for corrections.

7.2.4 Summary Correction Policy

	Summary SIX Correction Policy
Original Fixing	T + 0, 18:00 CET
Error Threshold (bp = 1/100 of a percent)	> 2 bp
Review of Error Threshold	Annual review or ad hoc depending on market conditions
Time window for correction & republication	Same day within 2 hours (20:00 – 22:00), provided errors have been identified by 20:00 CET.
Correction of Errors older than one day (i.e. past the time window)	No, but errors published under Transparency Policy.
Correction of derived rates/indices (e.g. Compound Rates/Indices)	Yes, if SARON gets corrected.
Transparency Policy (Publication of errors below threshold and errors identified late)	Yes, errors that did not meet republication criteria are published on a semiannual base

8 Governance

The Index Team at SIX is responsible for managing the indices. The team ensures that the index rules are adhered to and that meet the required quality standards. The Index Team is subject to a regulatory framework, with structured processes in place to ensure compliance. The main stakeholders and concepts are as follows.

In case of doubt, the German language version of the rule books shall be decisive.

8.1 Index Commission

SIX is supported by the Index Commission Swiss Reference Rates. The Index Commission provides input on index-related matters, in particular in connection with changes to the index rules as well as adjustments, inclusions and exclusions outside the defined periodic reviews.

The Commission meets at least twice a year and provides valuable input on how to improve existing products and create new ones.

8.2 Review of Index Concepts

The validity of the index concepts and the rules is reviewed on a regular basis and at least once a year. In exceptional cases, a broad market consultation may be conducted for this purpose. Changes to index rules are made in accordance with the relevant governance processes.

The effective date of changes to index rules will be aligned with the regular index review where possible to avoid any exceptional impact on clients and other stakeholders. Significant changes to the index rules should be publicly announced as standard three months prior to their implementation. SIX may decide to shorten the announcement period in some cases:

- In exceptional or urgent cases, or in situations that have no impact on clients or other stakeholders and where immediate communication is not possible. For example, when an investor can no longer replicate index performance with their portfolio. In such cases, changes or additions to the rules must be announced on the same day the new index rule or change is implemented.
- For immaterial changes to the index rules, i.e. clarifications of the rules.
- To coordinate with the dates of the regular index review and rebalancing of the index.

8.3 Market Consultations

Where possible, SIX consults with representatives of affected clients and other stakeholders for all material changes to index rules and the discontinuation of indices. In this context, a material change to the index rules means a change that "significantly alters the procedures used to determine an index" and thus materially affects the index value compared to an unchanged scenario.

The timing and duration of the consultation period depends on the materiality of the proposed changes to the index rules. By default, a market consultation for material changes lasts one month.

A summary of the market consultation comments and SIX' summary response to those comments will be made available to clients and stakeholders after each consultation period, unless the originator of the comments has requested confidentiality.

8.4 Termination of Indices

SIX will publicly announce a decision to discontinue an index with reasonable advance notice. The period depends on the impact. By default, a period of one month is scheduled.

SIX is not responsible for determining or offering an alternative index when an index is discontinued.

If there are financial products on the index of which SIX is aware, a market consultation will be conducted in advance and a transition period will be granted in the event of a final discontinuation. Otherwise, no market consultation will be carried out.

8.5 Determination of an Index

All indices in this rulebook use available prices (“Input Data”) received from SIX Swiss Exchange shortly after the official trading hours.

The index rules do not use extrapolation to determine the index value

The minimum data required for each SAR-related Rate, Compound Rate and Compound Index is the reference data of the instrument and a listing on SIX Repo Ltd, which means that a price is set for the instrument on a regular basis. No threshold is defined for the frequency or number of price updates of the underlying, as the objective of SAR-related rates is to measure the cost of capital in the Swiss repo market. Compounded rates operate at a higher level of abstraction of the repo market, as they only consider the daily closing prices of SARON (Swiss Average Over Night) and compound these closing prices over a certain tenor (1W, 1M, 2M, ..., 12M).

8.6 Potential Limitations in the Determination of an Index

If data necessary to determine the price or weighting of an index component is not available to SIX due to trading suspensions or market distortions, the last available data will be used. Such cases may lead to a deviation from the basic principles of the indices. These changes may relate to review schedules, ordinary reviews as well as adjustments in the index composition or weighting outside the ordinary reviews and will be publicly announced considering an announcement period of at least two business days.

In the event of structural changes in the market or economic environment, or if interest in a market has waned or is not functioning, the reliability of a methodology can no longer be guaranteed. SIX reviews the rulebooks at least once a year to anticipate such changes and mitigate their impact by making appropriate adjustments to the methodology.

8.7 Controls and Rules for the Exercise of Expert Judgement

The rules for the individual indices have been designed to eliminate discretionary or expert judgement in the index calculation as far as possible. Due to unforeseen market events or unavailable date, the following situations may occur:

- unexpected events, such as complex corporate actions, macroeconomic shocks, market disruptions, natural catastrophes
- technical reasons, such as missing closing prices due to a computer failure or the stock exchange or the inability of a data provider to deliver certain data points in a timely manner.
- when a rule allows for multiple interpretations (“unclear rule”)
- the absence of a rule that could potentially lead to a reduction in the meaningfulness of an index (“insufficient rule”)
- incorrect assessment of materiality in the case of changes to index rules

An escalation process has been implemented for such unexpected cases. As part of this process, SIX will evaluate and document the use of discretion. To the extent possible, the current rulebook will be updated to cover such unexpected cases with a new transparent rule.

In addition, any feedback from market participants on the use of discretion will generally be discussed in the upcoming Index Commission meeting.

Further documentation on regulation and processes can be found on the SIX website[14]. SIX reserves the right to adjust the index composition, the weightings of the components or the announcement periods based on the basic principles mentioned in section 2.

[14] https://www.six-group.com/en/products-services/the-swiss-stock-exchange/market-data/indices.html

9 External Communication

SIX uses the following tools to inform the market about index changes. These include changes to index compositions, the weighting of indices as well as ordinary and extraordinary index adjustments.

9.1 Reports

SIX creates and maintains reports containing information on index compositions, weighting of index components, corporate action announcements and other index-related information. SIX publishes the reports on its website, whereby the majority, however, is only made available to licensees. Some reports contain index-specific information, which is why the number of relevant reports varies from index to index. Depending on the timeliness of their information, the reports are updated with varying frequencies from daily to annual.

For the Swiss Reference Rates the following reports are provided:

- Reports of historical values for all rates and indices
- Report at the end of day with the latest SARON and SARON Index values
- The SARON Compound calculation matrix with all compounded SARON values of the last 12 months

9.2 Vendor Code Sheet

The Vendor Code Sheet contains information on the current ticker symbols, normalizations, launch dates and calculation parameters of the indices and is published on the SIX website.[15]

9.3 Newsletter Email Service

SIX provides detailed information on the reference rates and indices through the newsletter option “Index Service Swiss Reference Rates”. Interested parties can register for the newsletter email service on the SIX website[16]. Through this channel, SIX distributes all index-related communications. These include, among others:

- Changes to corporate actions and dividends
- Updates due to periodic index reviews
- Problems and errors in index calculation
- The launch or discontinuation of indices
- Market consultations
- Issuer surveys

Index Messages

The index messages from the newsletter email service in connection with index adjustments are published on the SIX website[17]. The index messages are publicly available and do not require a subscription or a license agreement.

Media Release

For index messages that are of broad public interest, SIX may publish a media release to inform the public about the index adjustment. In addition, media releases may be used for marketing purposes that are not related to index adjustments.

[15] https://www.six-group.com/dam/download/market-data/indices/six-calculated-indices.xls

[16] https://www.six-group.com/en/services/newsletter/the-swiss-stock-exchange/indices.html

[17] https://www.six-group.com/en/products-services/the-swiss-stock-exchange/market-data/indices/index-operation/index-messages.html#

10 Trademark, Protection, Use and Licensing

The Trademarks are the intellectual property (including registered trademarks) of SIX Index AG, Zurich, Switzerland. SIX Index AG provides no warranty of any kind, and excludes all liability (whether in negligence or otherwise) with respect to their use. The use of SIX Reference Rates and their registered trademarks (®) as well as access to restrictive reference rate data is governed by a licensing agreement. Information on licensing and the format of the disclaimer can be found on the SIX website.[18]

[18] https://www.six-group.com/en/products-services/the-swiss-stock-exchange/market-data/indices/index-operation/licensing.html

11 Contact

Inquiries about the Swiss reference rates can be sent to one of the following addresses:

Swiss Index Business Support
Index Sales, Licensing and Data
T +41 58 399 26 00
indexdata@six-group.com

Swiss Index Technical Support
Index Operations
T +41 58 399 22 29
indexsupport@six-group.com

12 Static Data

12.1 Average and Current Rate

Name	Short Name	Symbol	ISIN
SAR Swiss Average Rate ON	SAR® ON	SARON	CH0049613687
SAR Swiss Average Rate TN	SAR® TN	SARTN	CH0049613703
SAR Swiss Average Rate SN	SAR® SN	SARSN	CH0049613711
SAR Swiss Average Rate 1W	SAR® 1W	SAR1W	CH0049613737
SAR Swiss Average Rate 2W	SAR® 2W	SAR2W	CH0049613745
SAR Swiss Average Rate 3W	SAR® 3W	SAR3W	CH0049613752
SAR Swiss Average Rate 1M	SAR® 1M	SAR1M	CH0049613760
SAR Swiss Average Rate 2M	SAR® 2M	SAR2M	CH0049613778
SAR Swiss Average Rate 3M	SAR® 3M	SAR3M	CH0049613786
SAR Swiss Average Rate 6M	SAR® 6M	SAR6M	CH0049613802
SAR Swiss Average Rate 9M	SAR® 9M	SAR9M	CH0049613810
SAR Swiss Average Rate 12M	SAR® 12M	SAR12M	CH0049613828
SCR Swiss Current Rate ON	SCR® ON	SCRON	CH0049613901
SCR Swiss Current Rate TN	SCR® TN	SCRTN	CH0049613919
SCR Swiss Current Rate SN	SCR® SN	SCRSN	CH0049613927
SCR Swiss Current Rate 1W	SCR® 1W	SCR1W	CH0049613935
SCR Swiss Current Rate 2W	SCR® 2W	SCR2W	CH0049613950
SCR Swiss Current Rate 3W	SCR® 3W	SCR3W	CH0049613968
SCR Swiss Current Rate 1M	SCR® 1M	SCR1M	CH0049613976
SCR Swiss Current Rate 2M	SCR® 2M	SCR2M	CH0049613984
SCR Swiss Current Rate 3M	SCR® 3M	SCR3M	CH0049613992
SCR Swiss Current Rate 6M	SCR® 6M	SCR6M	CH0049614008
SCR Swiss Current Rate 9M	SCR® 9M	SCR9M	CH0049614016
SCR Swiss Current Rate 12M	SCR® 12M	SCR12M	CH0049614024

12.2 Indices on the Average, Current and Compound Rates

Name	Short Name	Symbol	ISIN
SARON Index	SAION®	SAION	CH0100517157
Swiss Current Index ON	SCION®	SCION	CH0100484986
SARON 1 week Compound Index	SARON1WC Index	SARO1WI	CH0599147359
SARON 1 month Compound Index	SARON1MC Index	SARO1MI	CH0599147292
SARON 2 months Compound Index	SARON2MC Index	SARO2MI	CH0599147300

Name	Short Name	Symbol	ISIN
SARON 3 months Compound Index	SARON3MC Index	SARO3MI	CH0572109855
SARON 6 months Compound Index	SARON6MC Index	SARO6MI	CH0599147318
SARON 9 months Compound Index	SARON9MC Index	SARO9MI	CH0599147326
SARON 12 months Compound Index	SARON12MC Index	SARO12MI	CH0599147334

12.3 SARON Compound Rates

Name	Short Name	Symbol	ISIN
SARON 1 week Compound Rate	SARON1W Comp	SAR1WC	CH0599147342
SARON 1 month Compound Rate	SARON1M Comp	SAR1MC	CH0477123886
SARON 2 months Compound Rate	SARON2M Comp	SAR2MC	CH0477123894
SARON 3 months Compound Rate	SARON3M Comp	SAR3MC	CH0477123902
SARON 6 months Compound Rate	SARON6M Comp	SAR6MC	CH0477123910
SARON 9 months Compound Rate	SARON9M Comp	SAR9MC	CH0477123928
SARON 12 months Compound Rate	SARON12M Comp	SAR12MC	CH0477123936
SARON 1 IMM Compound Rate	SARON1IMM Comp	SAR1IMMC	CH0477123860
SARON 3 IMM Compound Rate	SARON3IMM Comp	SAR3IMMC	CH0477123878

The following link contains a list of the master data of all rates and indices calculated by SIX:

https://www.six-group.com/exchanges/downloads/indexinfo/online/calculated_indices.xls

Appendix A Formulas for Lookback Calculations

To support the move away from LIBOR and to further increase the acceptance of the Swiss Reference Rates, SIX would like to highlight the established convention of "Lookbacks". These calculation methods give the lender and borrower sufficient time to process the final payment under an "in-arrears" method. The most common Lookback methods are:

Option 1: Loockback **without** observation shift ("Lag")

Option 2: Lookback **with** observation shift ("Shift")

SIX currently does not offer Compound Indices and Rates based on Lookback conventions. However, should a need arise for corresponding compound rates and indices in the form of a benchmark, SIX would of course provide corresponding calculations.

The underlying principle for Lookbacks is the separation of the observation date and interest date. The former refers to the day on which the interest rate was observed in the market, the latter to the day on which this interest rate is applied. Without a Lookback (i.e. "Plain"), the observation date is identical to the interest date for (i.e. interest date = observation date).

SARON with no Lookback ("Plain")

Interest date	Observation date	Weekday	SARON	Applied days
26.03.2021	26.03.2021	Friday	-0.726038	3
29.03.2021	29.03.2021	Monday	-0.725177	1
30.03.2021	30.03.2021	Tuesday	-0.725230	1
31.03.2021	31.03.2021	Wednesday	-0.723340	1
01.04.2021	01.04.2021	Thursday	-0.724835	5
06.04.2021	06.04.2021	Tuesday	-0.725452	1
07.04.2021	07.04.2021	Wednesday	-0.725747	1
08.04.2021	08.04.2021	Thursday	-0.726112	1
09.04.2021	09.04.2021	Friday	-0.725439	3
12.04.2021	12.04.2021	Monday	-0.726107	1
13.04.2021	13.04.2021	Tuesday	-0.726084	1
14.04.2021	14.04.2021	Wednesday	-0.725833	1
15.04.2021	15.04.2021	Thursday	-0.726011	1
16.04.2021	16.04.2021	Friday	-0.726723	3

Without Lookback, the date from which the SARON rate is taken (observation date) corresponds to the date on which the interest is applied to (interest date) and applies until the next business day.

Example: The interest rate of April 9th is applied for three days on April 9th. In contrast, the interest rate on April 12th is applied for one day.

With the in-arrears calculation of SARON compound rates based on daily rates, the final payment only becomes apparent at the end of the interest period. As mentioned above, this complicates the timely processing of payments based on SARON compound rates, as not all parties involved have the appropriate logistics in place.

A.1 Option 1: Lookback Without Observation Shift ("Lag")

Counterparties get more flexibility by applying a SARON rate observed some business days before interest date. This means that the observation date of the interest rate is a few days before the application date (interest date) of this rate. If the lookback is L days, the observation date of the interest rate is L days before the interest date. All other elements of the calculation remain the same.

SARON with Lookback of Five Days ("Lag")

Interest Date	Observation Date	Weekday	SARON	Applied days
26.03.2021	26.03.2021	Friday	-0.726038	3
29.03.2021	29.03.2021	Monday	-0.725177	1
30.03.2021	30.03.2021	Tuesday	-0.725230	1
31.03.2021	31.03.2021	Wednesday	-0.723340	1
01.04.2021	01.04.2021	Thursday	-0.724835	5
06.04.2021	06.04.2021	Tuesday	-0.725452	1
07.04.2021	07.04.2021	Wednesday	-0.725747	1
08.04.2021	08.04.2021	Thursday	-0.726112	1
09.04.2021	09.04.2021	Friday	-0.725439	3
12.04.2021	12.04.2021	Monday	-0.726107	1
13.04.2021	13.04.2021	Tuesday	-0.726084	1
14.04.2021	14.04.2021	Wednesday	-0.725833	1
15.04.2021	15.04.2021	Thursday	-0.726011	1
16.04.2021	16.04.2021	Friday	-0.726723	3

With a Lookback of five days without shifting the observation, the observation date of the SARON is five business days before the effective interest date (the date of application of the interest rate). In this case, the interest rate is applied until the next business day.

Example: The interest rate of March 31st will be applied on April 9th for three days, while the interest rate of April 1st will be applied on April 12th for one day.

A.2 Option 2: Lookback with Shift of Observation ("Shift")

A Lookback with observation shift also uses a SARON rate observed a few business days before the interest date. Compared to a Lookback without observation shift, however, not only the past interest rate is applied, but also the number of calendar days for which this rate is valid. Thus, the interest rate as well as the number of applicable days of this interest rate originate from the past period.

SARON with Lookback of Five Days ("Shift")

Interest Date	Observation Date	Weekday	SARON	Applied days
26.03.2021	26.03.2021	Friday	-0.726038	3
29.03.2021	29.03.2021	Monday	-0.725177	1
30.03.2021	30.03.2021	Tuesday	-0.725230	1
31.03.2021	31.03.2021	Wednesday	-0.723340	1
01.04.2021	01.04.2021	Thursday	-0.724835	5
06.04.2021	06.04.2021	Tuesday	-0.725452	1
07.04.2021	07.04.2021	Wednesday	-0.725747	1
08.04.2021	08.04.2021	Thursday	-0.726112	1
09.04.2021	09.04.2021	Friday	-0.725439	3
12.04.2021	12.04.2021	Monday	-0.726107	1
13.04.2021	13.04.2021	Tuesday	-0.726084	1
14.04.2021	14.04.2021	Wednesday	-0.725833	1
15.04.2021	15.04.2021	Thursday	-0.726011	1
16.04.2021	16.04.2021	Friday	-0.726723	3

With a Lookback of five day with shifting the observation, not only the interest rate from an observation date that is five in the past is used, but also the number of calendar days for which it applies.

Example: The interest rate of March 31st will be applied on April 9th for one day, while the interest rate of April 1st will be applied on April 12th for five days.

A.3 Adjustments to the Compound Rate Formula

The Lookback methode also affects the compounding of SARON interest rates. The corresponding formulas undergo a slight adjustment. For a Lookback without observation shift (“Lag”), only the interest rate (r_{i-5}) is adjusted, compared to the formula in section 5.1:

$$SARON\ Compound\ Rate_{(LB5\ "Lag")} = \left[\prod_{i=1}^{bd}\left(1+\frac{r_{i-5}\ a_i}{360}\right)-1\right]\frac{360}{n}$$

$$n = \sum_{i=1}^{bd} a_i$$

In case of a Lookback with observation shift, not only the interest rate (r_{i-5}) from the previous period is applied, but also the number of calendar days (a_{i-5}):

$$SARON\ Compound\ Rate_{(LB5\ "shift")} = \left[\prod_{i=1}^{bd}\left(1+\frac{r_{i-5}\ a_{i-5}}{360}\right)-1\right]\frac{360}{n}$$

$$n = \sum_{i=1}^{bd} a_{i-5}$$

Where:

bd Number of business days for an observation period from the start date (inclusive) to the end date (exclusive). For example, bd is equal to one (1) for an observation period from Monday to Tuesday

i Index from one (1) to bd

n Number of calendar days of the observation period from the start date (inclusive) to the end date (exclusive). For example n is equal to one (1) for an observation period from Monday to Tuesday.

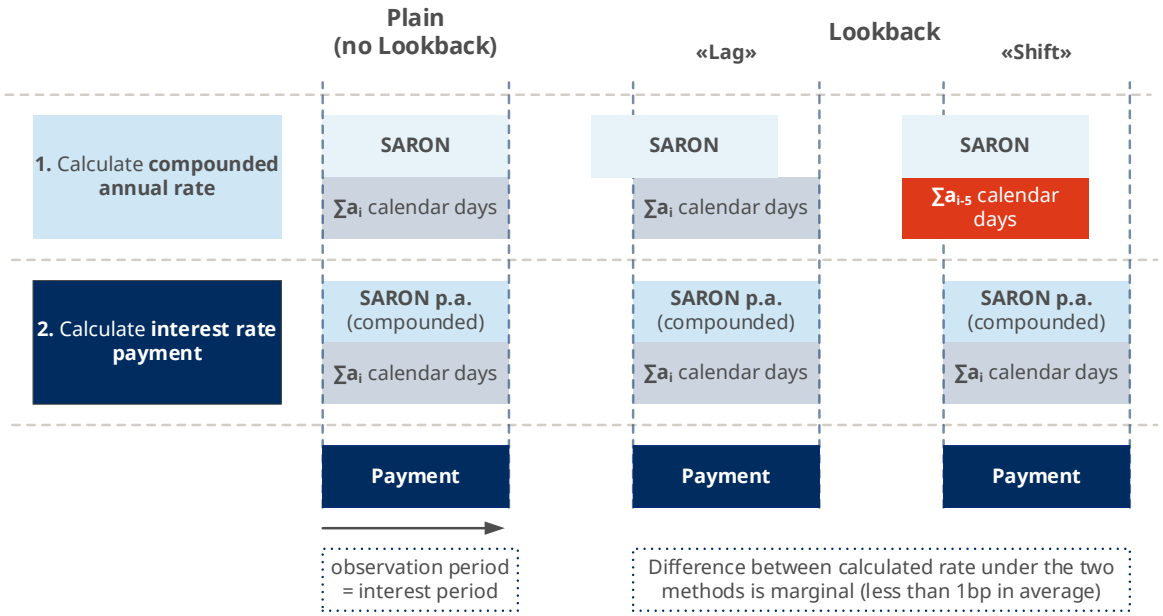
r_i SARON on business day i. If the start date is not a business day, the SARON from the previous business day is used.

a_i Number of calendar days for which SARON r_i applies. If the observation period ends on a Sunday, a_i normally includes two days (2). If the observation period starts on a Sunday, a_i is equal to one (1) and the SARON of the previous business day is used. If the Friday before and/or the Monday after the weekend is a holiday, a_i increases by the number of holidays.

A.4 Calculation of Interest Payments

Once lender and borrower have agreed on the interest and observation period (i.e., start and end dates), the calculation of interest payments is performed in two steps:

1. Calculation of the compounded interest rate (annualized) taking into account the respective Lookback ("Lag" or "Shift")
2. Application of the compounded interest rate (annualized) to the interest period to determine the payment



In the "Plain" option (no Lookback), the application date of the SARON rate is not shifted and the standard formula is applied (see section 5.1). Intuitively, this is the simplest method to perform the compounding. However, only a few companies and households are logistically able to perform same-day settlement of historical compounding (i.e., "in-arrears"), since the final payment cannot be determined until 18:00 in the evening of the second last business day of the interest period.

Lookbacks alleviate this problem. A Lookback of three to five days is sufficient to take account for the operational aspects of settlement. However, it should be noted that the number of days in the compounding period may vary depending on the type of lookback. The "Lag" option of the lookback only shifts the interest rates, while the "Shift" option also moves the number of calendar days on which the interest rate is applied. Therefore, the interest rate of the compounded SARON also differs under the different Lookbacks.

However, the difference between the various compounded SARON rates is small and is further alleviated by the fact that the calculation of the interest payment is based on the number of days in the interest period. This also applies to the two Lookback options. For the purpose of illustration, the following example is using the one-month compounded rate from the 4th of January to the 1st of February 2021 under the different Lookback options:

Start Date	04.01.2021
End Date	01.02.2021
Loan Size (CHF)	1'000'000.00
Rate	SARON 1 month Compound Rate

Annual Rate

	# Calendar Days	Compound Rate (%)	Δ "Plain" (bp)
No Lookback ("Plain")	28	-0.7247	
Lookback ("Lag")	28	-0.7243	0.04
Lookback ("Shift")	**32**	-0.7241	0.06

Payment

	# Calendar Days	Payment	Δ "Plain" (CHF)
No Lookback ("Plain")	28	-563.69	
Lookback ("Lag")	28	-563.37	0.32
Lookback ("Shift")	**28**	-563.22	0.47

The "Shift" version of the Lookback only uses the extended number of calendar days (reaching back into the previous month) to calculate the compounded rate. For the calculation of the payment, however, the number of calendar days is the same as with the other methods.

A.5 Calculation Compound Rate With No Lookback

No Lookback ("Plain")

Interest Date	Observation Date	Weekday	SARON	Applied days	Cum. Multiplier	Cum. Days	Compound Rate
24.12.2020	24.12.2020	Thursday	-0.722182	4			
28.12.2020	28.12.2020	Monday	-0.722135	1			
29.12.2020	29.12.2020	Tuesday	-0.721350	1			
30.12.2020	30.12.2020	Wednesday	-0.719763	1			
31.12.2020	31.12.2020	Thursday	-0.726264	4			
04.01.2021	04.01.2021	Monday	-0.725865	1	0.9999798371	1	-0.7259
05.01.2021	05.01.2021	Tuesday	-0.724515	1	0.9999597121	2	-0.7252
06.01.2021	06.01.2021	Wednesday	-0.725798	1	0.9999395518	3	-0.7254
07.01.2021	07.01.2021	Thursday	-0.723893	1	0.9999194449	4	-0.7250
08.01.2021	08.01.2021	Friday	-0.723406	3	0.9998591659	7	-0.7243
11.01.2021	11.01.2021	Monday	-0.723857	1	0.9998390616	8	-0.7242
12.01.2021	12.01.2021	Tuesday	-0.725365	1	0.9998189158	9	-0.7243
13.01.2021	13.01.2021	Wednesday	-0.724834	1	0.9997987852	10	-0.7244
14.01.2021	14.01.2021	Thursday	-0.725108	1	0.9997786474	11	-0.7244
15.01.2021	15.01.2021	Friday	-0.724917	3	0.9997182510	14	-0.7245
18.01.2021	18.01.2021	Monday	-0.725357	1	0.9996981079	15	-0.7245
19.01.2021	19.01.2021	Tuesday	-0.724997	1	0.9996779751	16	-0.7246
20.01.2021	20.01.2021	Wednesday	-0.725047	1	0.9996578414	17	-0.7246
21.01.2021	21.01.2021	Thursday	-0.725562	1	0.9996376938	18	-0.7246
22.01.2021	22.01.2021	Friday	-0.725711	3	0.9995772398	21	-0.7247
25.01.2021	25.01.2021	Monday	-0.725137	1	0.9995571056	22	-0.7247
26.01.2021	26.01.2021	Tuesday	-0.724880	1	0.9995369790	23	-0.7247
27.01.2021	27.01.2021	Wednesday	-0.725359	1	0.9995168395	24	-0.7247
28.01.2021	28.01.2021	Thursday	-0.725297	1	0.9994967021	25	-0.7247
29.01.2021	29.01.2021	Friday	-0.725018	3	0.9994363143	28	-0.7247

Interest Date	Observation Date	Weekday	SARON	Applied days	Cum. Multiplier	Cum. Days	Compound Rate
01.02.2021	01.02.2021	Monday					

A.6 Calculation Compound Rate With Lookback and No Shift

Lookback without observation shift ("Lag")

Interest Date	Observation Date	Weekday	SARON	Applied days	Cum. Multiplier	Days Cum.	Compound Rate
24.12.2020	24.12.2020	Thursday	-0.722182				
28.12.2020	28.12.2020	Monday	-0.722135				
29.12.2020	29.12.2020	Tuesday	-0.721350				
30.12.2020	30.12.2020	Wednesday	-0.719763				
31.12.2020	31.12.2020	Thursday	-0.726264				
04.01.2021	04.01.2021	Monday	-0.725865	1	0.9999799394	1	-0.7222
05.01.2021	05.01.2021	Tuesday	-0.724515	1	0.9999598805	2	-0.7222
06.01.2021	06.01.2021	Wednesday	-0.725798	1	0.9999398438	3	-0.7219
07.01.2021	07.01.2021	Thursday	-0.723893	1	0.9999198516	4	-0.7213
08.01.2021	08.01.2021	Friday	-0.723406	3	0.9998593344	7	-0.7234
11.01.2021	11.01.2021	Monday	-0.723857	1	0.9998391743	8	-0.7237
12.01.2021	12.01.2021	Tuesday	-0.725365	1	0.9998190522	9	-0.7238
13.01.2021	13.01.2021	Wednesday	-0.724834	1	0.9997988948	10	-0.7240
14.01.2021	14.01.2021	Thursday	-0.725108	1	0.9997787907	11	-0.7240
15.01.2021	15.01.2021	Friday	-0.724917	3	0.9997185202	14	-0.7238
18.01.2021	18.01.2021	Monday	-0.725357	1	0.9996984187	15	-0.7238
19.01.2021	19.01.2021	Tuesday	-0.724997	1	0.9996782757	16	-0.7239
20.01.2021	20.01.2021	Wednesday	-0.725047	1	0.9996581479	17	-0.7239
21.01.2021	21.01.2021	Thursday	-0.725562	1	0.9996380129	18	-0.7240
22.01.2021	22.01.2021	Friday	-0.725711	3	0.9995776250	21	-0.7241
25.01.2021	25.01.2021	Monday	-0.725137	1	0.9995574848	22	-0.7241
26.01.2021	26.01.2021	Tuesday	-0.724880	1	0.9995373549	23	-0.7241
27.01.2021	27.01.2021	Wednesday	-0.725359	1	0.9995172240	24	-0.7242
28.01.2021	28.01.2021	Thursday	-0.725297	1	0.9994970792	25	-0.7242
29.01.2021	29.01.2021	Friday	-0.725018	3	0.9994366337	28	-0.7243
01.02.2021	01.02.2021	Monday					

A.7 Calculation Compound Rate With Lookback and Shift (“Shift”)

Lookback with observation shift ("Shift")

Interest Date	Observation Date	Weekday	SARON	Applied days	Cum. Multiplier	Days Cum.	Compound Rate
24.12.2020	24.12.2020	Thursday	-0.722182	4			
28.12.2020	28.12.2020	Monday	-0.722135	1			
29.12.2020	29.12.2020	Tuesday	-0.72135	1			
30.12.2020	30.12.2020	Wednesday	-0.719763	1			
31.12.2020	31.12.2020	Thursday	-0.726264	4			
04.01.2021	04.01.2021	Monday	-0.725865	1	0.9999197576	4	-0.7222
05.01.2021	05.01.2021	Tuesday	-0.724515	1	0.9998996999	5	-0.7222
06.01.2021	06.01.2021	Wednesday	-0.725798	1	0.9998796644	6	-0.7220
07.01.2021	07.01.2021	Thursday	-0.723893	1	0.9998596734	7	-0.7217
08.01.2021	08.01.2021	Friday	-0.723406	3	0.9997789887	11	-0.7233
11.01.2021	11.01.2021	Monday	-0.723857	1	0.9997588302	12	-0.7235
12.01.2021	12.01.2021	Tuesday	-0.725365	1	0.9997387097	13	-0.7236
13.01.2021	13.01.2021	Wednesday	-0.724834	1	0.9997185539	14	-0.7237
14.01.2021	14.01.2021	Thursday	-0.725108	1	0.9996984514	15	-0.7237
15.01.2021	15.01.2021	Friday	-0.724917	3	0.9996381857	18	-0.7236
18.01.2021	18.01.2021	Monday	-0.725357	1	0.9996180859	19	-0.7236
19.01.2021	19.01.2021	Tuesday	-0.724997	1	0.9995979445	20	-0.7237
20.01.2021	20.01.2021	Wednesday	-0.725047	1	0.9995778184	21	-0.7237
21.01.2021	21.01.2021	Thursday	-0.725562	1	0.9995576850	22	-0.7238
22.01.2021	22.01.2021	Friday	-0.725711	3	0.9994973019	25	-0.7239
25.01.2021	25.01.2021	Monday	-0.725137	1	0.9994771633	26	-0.7239
26.01.2021	26.01.2021	Tuesday	-0.72488	1	0.9994570350	27	-0.7240
27.01.2021	27.01.2021	Wednesday	-0.725359	1	0.9994369057	28	-0.7240
28.01.2021	28.01.2021	Thursday	-0.725297	1	0.9994167626	29	-0.7240
29.01.2021	29.01.2021	Friday	-0.725018	3	0.9993563219	32	-0.7241
01.02.2021	01.02.2021	Monday					

SIX
Pfingstweidstrasse 110
8005 Zurich
Switzerland

T +41 58 399 2111